

ends up with about 8V across it, requiring the 100mA capability LT1054 to sink about 24mA. The  $0.02\mu\text{F}$  capacitor stabilizes the loop. The A1-LT1054 loop negative output sets the bridge's common-mode voltage to zero, allowing A2 to take a simple single ended measurement. The "output trim" scales the circuit for 3mV/V type strain bridge transducers, and the 100k- $0.1\mu\text{F}$  combination provides noise filtering.

## Thermistor Signal Conditioner for Current Loop Application

4-20mA "current loop" control is common in industrial environments. Circuitry used to modulate transducer data into this loop must operate well below the 4mA minimum current.

Figure 6 shows a complete 2-wire thermistor temperature transducer interface with a 4-20mA output. Over a 0°C-100°C range, accuracy is  $\pm 0.3^\circ\text{C}$  and the circuit is current loop powered. No external supply is required. The

LM134 current source absorbs the 40V input, preventing the LTC1040 from seeing too high a supply potential. It does this by fixing the current well below the 4mA loop minimum. The LTC1040 (detailed data on this device appears in Box Section B, "Sampling Techniques and Components for Micropower Circuits") senses the YSI thermistor network output and forces this voltage across the output resistor to set total circuit current. Current is adjusted by varying the gate voltage on the 2N6657 FET. Note that the comparator output operates in pulse-width-modulation mode, with the FET gate voltage filtered to DC by the  $1M-1\mu F$  combination. An important LTC1040 feature is that very little current, on the order of nanoamperes, flows from the  $V^-$  supply. This allows the  $V^-$  supply to be connected to ground with negligible current error in the output sensing resistor. The differential input of the LTC1040 can sense the current through  $R_{OUT}$  because its common-mode range includes the  $V^-$  supply. Trims shown are for  $0^\circ C$  and  $100^\circ C$  and are made by exposing the thermistor to those temperatures or by electrically simulating the conditions (see manufacturer's datasheet).

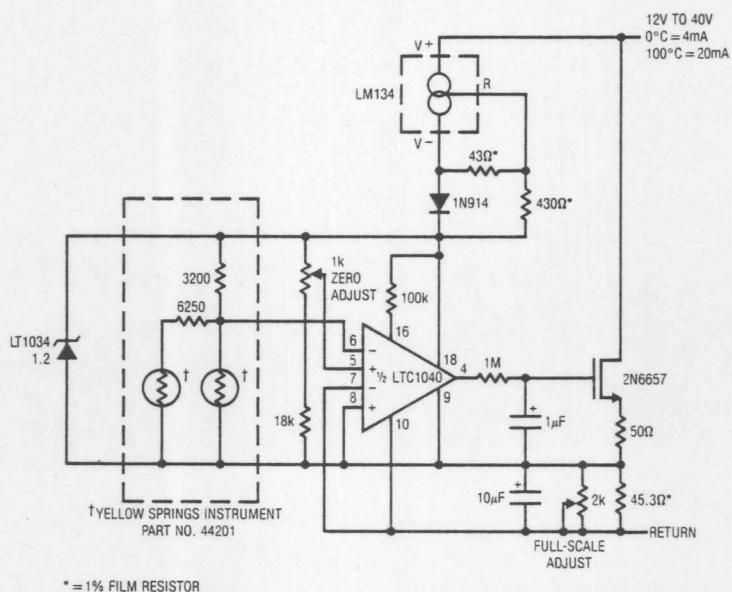


Figure 6. Thermistor Based Current Loop Signal Conditioner